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Claims

1. A system for performing fluid administration on a patient comprising :
- a single liquid pump (1),
10 - a liquid distribution system (2) connected to said pump (1) in such a way that liquid can flow from the liquid distribution system (2) to the pump (1) via a pump enter line (56) and vice versa via a pump exit line (57),
- liquid supply means (3) for supplying liquid to a patient (4) via said liquid distribution system (2) and said pump (1),
15 - a patient conduit (5) adapted for connecting said liquid distribution system (2) to a patient (4),
characterized by the fact that said liquid pump (1) is unidirectional and that said liquid distribution system (2) comprises switching means designed to alternatively connect the pump enter line (56) with the supply means (3) or
20 with the patient conduit (5).
2. A system according to the previous claim furthermore comprising a drain line (25), said switching means being also designed to alternatively connect the pump exit line (57) with the drain line (25) or with the patient
25 conduit (5).
3. A system according to claim 1 or 2 wherein the liquid pump (1) is a peristaltic pump.
- 30 4. A system according to the previous claim wherein the peristaltic pump is rotatable.
- 35 5. A system according to anyone of the previous claims wherein said liquid distribution system (2) comprises two distinct hub chambers (7,8), the first hub chamber (7) including at least one liquid supply port with dedicated valve means (9), one patient port with dedicated valve means (10) and one pump inlet (26) , the second hub chamber (8) including at least, one

- 5 patient port (18) or warmer port (16) with dedicated valve means and one pump outlet (27), said system furthermore comprising control means arranged to close said patient port (10) of the first hub chamber (7) when said liquid supply port (9) is open and vice versa.
- 10 6. System according to the previous claim wherein said second hub chamber (8) furthermore includes at least one drain port with dedicated valve means (11), said control means being also arranged to close said patient port (18) of the second hub chamber (8) when said drain port (11) is open and vice versa.
- 15 7. A system according to claim 5 or 6 wherein said liquid distribution system (2) only includes two hub chambers (7,8).
- 20 8. A system according to anyone of the previous claims furthermore comprising a warmer system (28), a cavity (17) including a warmer port(19) and a patient port (16), said patient port (18) of the second hub chamber (8) being connected to said warmer port (19) via said warmer system (28).
- 25 9. A system according to the previous claim wherein said warmer system (28) is a warmer in-line.
- 30 10. A system according to the previous claim wherein said warmer in-line comprises a warming plate contained therein, such warming plate being covered by a warming pouch like a sock.
- 35 11. A system according to the previous claim wherein said warming pouch is composed of a liquid channel which forces the liquid to be maintained within such warmer for a certain duration at a given flow rate.

5 12.A system according to anyone of the previous claims wherein said first hub chamber (7) includes several liquid supply ports with respective valve means (9).

10 13.A system according to the previous claim wherein said liquid supply ports (9) are connected to respective liquid supply means having each a different kind of liquid.

15 14.A system according to anyone of the previous claims wherein said liquid pump (1) is composed of a tubing and rolling surface on which the tubing is compressed once the cartridge is inserted into a pumping device containing rollers.

20 15.A system according to the previous claim where said rollers (22) are of a conical shape in such a way as to be self inserted in the pump race, i.e. without any other mechanism.

16. A system according to claim 14 where said rollers are of a spherical shape.

25 17.A system according to anyone of the previous claims wherein said liquid pump (1) and said liquid distribution system (2) are fixed together to form a single cartridge.

30 18.A system according to the previous claim wherein said liquid pump (1) is fixed to said liquid distribution system (2) by vibration attenuation means in order to minimize the vibration on the liquid distribution system (2) when the pump is operating.

35 19.A system according to anyone of the previous claims wherein all hub chambers, including said ports and ports, are made within one single part.

- 5 20.A system according to the previous claim wherein said single part is an injected part of plastic material.
- 10 21.A system according to anyone of the previous claims wherein each hub chamber (7,8) is closed with an upper wall made of a flexible membrane (13), said membrane including valve elements (39) situated above each of said port or port with valve means, said valve elements (39) being designed to close said port or port when the membrane (13) moves downwardly.
- 15 22.A system according to the previous claim wherein said membrane is molded.
- 20 23.A system according to the previous claim wherein said membrane is made of silicone .
- 25 24.A system according to the previous claim wherein said membrane includes liquid tight joints.
- 30 25.A system according to anyone of the previous claims wherein said liquid distribution system includes liquid tight joints arranged in such a manner that they allow a liquid tight connection between said liquid distribution system and a membrane situated on it.
- 35 26.A system according to anyone of claims 21 to 24 wherein said membrane contains protruding elements designed for a liquid tight connection between said hub chambers.
- 27.A system according to claim 21 wherein each of said valve elements (39) is designed to be clipped to an actuator (34), e.g. an electromagnetic actuator or a magnet, arranged above said membrane (13).

- 5 28.A system according to the previous claim wherein each of said valve elements comprises a cavity designed to receive and hold the plunger of an actuator, said cavity having an height which substantially corresponds to at least the valve displacement.
- 10 29.A system according to anyone of claim 21 to 28 wherein said membrane (13) is press-fitted along its external border to the liquid distribution system, the membrane (13) being furthermore held by a frame (14) .
- 15 30.A system according to anyone of claim 21 to 29 wherein said membrane (13) contains a portion (15) which is forming part of a pressure sensor.
- 20 31.A system according to the previous claim wherein the active area of said pressure sensor is designed to be more flexible than the remaining area.
- 25 32.A system according to claim 30 or 31 wherein said pressure sensor has the shape of a disc of which the periphery is gripped, said disc furthermore comprising an annular ply.
- 30 33.A system according to anyone of claims 30 to 31 wherein said pressure sensor is situated on the patient line, independently from said hub chambers.
- 35 34.A system according to anyone of claims 30 to 33 furthermore comprising a second pressure sensor, said second pressure sensor being in connection with the first hub chamber.
- 35 35.A system according to anyone of the previous claims wherein said liquid distribution system includes an air sensor situated on the patient conduit side.

- 5 36.A system according to anyone of the previous claims comprising a
 cartridge loading mechanism which allows a tight connection between the
 membrane and the valves and the liquid distribution system.
- 10 37.A liquid distribution system (2) for a system performing fluid administration
 on a patient as defined in anyone of the previous claims.
- 38.A pressure sensor for a system for performing fluid administration on a
 patient as defined in anyone of claims 30 to 36.
- 15 39.A system according to anyone of the previous claims furthermore
 comprising a window for detecting correct positioning of the tube.
- 40.Method of use of the system as defined in anyone of the previous claims
 wherein said patient port (10) is closed when said liquid supply port (9) is
20 open and vice versa.
- 41.Method according to the previous claim wherein the pressure is always
 maintained positive with respect to the drain.
- 25 42.Method according to claim 40 or 41 wherein said liquid is always pumped
 in the same direction.
- 43.Method according to anyone of claims 40 to 42 consisting of sensing the
 liquid pressure entering and exiting the liquid distribution system and, if
30 necessary, correct the pump flow rate in accordance with the pressure
 difference.
- 44.Method according to anyone of claims 40 to 43 consisting in regulating the
 pump flow rate according to a known predetermined alteration of the flow
35 rate by aging of the tubing.

- 5 45. Method according to anyone of claims 40 to 44 wherein the drain phase is a function of the drain speed, said drain phase being ended when the speed is reaching a certain value based on the patient peritoneal cavity pressure measurement.
- 10 46. Method according to anyone of claims 40 to 45 wherein the peritoneal volume filled during a cycle is a function of the intra-peritoneal pressure.
- 15 47. Method according to the previous claim wherein the peritoneal cavity is partially emptied as soon as the pressure has reached a predefined threshold.
- 20 48. Method according to anyone of claims 40 to 47 consisting in the use of a low Sodium concentration liquid for the last exchange cycle to improve ultra-filtration.
49. Use of a system as defined in anyone of the previous claims for peritoneal dialysis.